

R E M A R K S

A new title is introduced hereinabove.

A new ABSTRACT OF THE DISCLOSURE is provided herein.

Claims 1 and 11 to 13 were amended to include features that are supported by the paragraph bridging pages 5 and 6 of the specification and the first full paragraph on page 6 of the specification.

Claim 1 was also amended to include the features of claims 2 and 3.

The other claim amendments involve editorial revisions.

New claim 22 is supported in the specification on page 5, line 31.

New claim 23 is supported in the specification on page 6, lines 27 to 28.

New claim 24 is supported in the specification on page 10, line 10.

New claim 25 is supported in the specification on page 11, line 3.

New claim 26 is supported in the specification on page 13, line 32.

In reply to the first two paragraphs on page 6 of the Official Action, a REQUEST FOR FULLY INITIALED COPY OF FORM PTO/SB/08A is submitted herewith. Attached to said REQUEST are copies of the following papers which were mailed to the USPTO on October 7, 2003 as part of an INFORMATION DISCLOSURE STATEMENT: Form PTO/SB/08A, a copy of a European Search Report and a copy of EP 451,456.

All of the present independent claims 1, 11, 12 and 13 above relate to an improvement of the direct leaching of zinc from zinc concentrate based on equation (A) in Paragraph [0012] on page 5 of the present specification $(\text{ZnS} + \text{Fe}_2(\text{SO}_4)_3 \rightarrow \text{ZnSO}_4 + 2\text{FeSO}_4 + \text{S})$, wherein elemental sulfur is produced as a solid state by-product.

Claims 1 to 6 and 11 to 18 were rejected under 35 USC 103 as being unpatentable over Evans et al. USP 5,007,589 in view of Weir USP 4,606,763 for the reasons set forth beginning in the penultimate line on page 2 and continuing to the bottom of page 4 of the Office Action.

It was admitted at the top of page 4 of the Office Action that Evans et al. do not disclose milling a zinc concentrate in

an aqueous solution containing free sulfuric acid and ferric ions.

Claims 7, 8, 19 and 20 were rejected under 35 USC 103 as being unpatentable over Evans et al. USP 5,007,589 in view of Weir USP 4,606,763 and further in view of Andre USP 4,676,828 for the reasons set forth in the first paragraph on page 5 of the Office Action.

The above described equation (A) is known as described in column 3, line 25 in USP 4,606,763 to Weir. However, Weir teaches a method that the leaching using such an equation is carried out under an oxygen overpressure of 200 to 2000 kPa at an elevated temperature from about 135 to 150°C (see column 3, lines 31-36 of Weir '763).

The treating temperature of not less than 135°C in Weir is higher than the melting point of sulfur, which means that even if elemental sulfur is formed, it would hardly be possible to be maintained in a solid state. Also Weir teaches that a high degree of sulfur oxidation occurs in the compartment and such sulfur oxidation creates heat to maintain an autogeneous temperature which provides the required heat for pyrite oxidation (see column

3, lines 46-53 in Weir). Under such conditions it would hardly be possible to maintain elemental sulfur in a solid state. Accordingly, Wier's method is in direct contradiction to the applicants' present independent claims. Also, the sulfur oxidation to create heat in Weir is irrelevant to applicants' claim 1.

Particularly, in applicants' claim 1 equation (A) progresses under an atmospheric pressure with the forming of elemental sulfur which is deposited as a solid state onto the surface of the zinc concentrate and with the stripping of the elemental sulfur by grinding the zinc concentrate. Thus, applicants' claim 1 is distinguished from Weir's method by the features of an atmospheric pressure condition and the formation of a solid state sulfur which remains in a solid state throughout the process.

In applicants' claim 11, a pressurized oxidation step serves to oxidize a ferrous ion-containing solution into a ferric ion-containing acidic solution, but does not oxidize the elemental sulfur deposited by the equation (A). This is apparent from the following recitation which is expressed in the present claim 11: "the elemental sulfur and other by-products which form

on the surfaces of the particles of the zinc concentrate are stripped." Accordingly, the sulfur oxidation to create heat in Weir is irrelevant for applicants' claim 11.

In applicants' claim 12, a pressurized oxidation and leaching step is carried out at a temperature of 120°C or below, wherein the deposited elemental sulfur remains in a solid state as discussed, for example, on page 11, lines 10 to 19 of the present specification. Thus, the sulfur oxidation to create heat in Weir is irrelevant with respect to applicants' claim 12.

As in applicants' claim 11, the pressurized oxidation step of applicants' claim 13 relates to oxidizing a ferrous ion-containing solution into a ferric iron-containing acidic solution, but not to oxidize the elemental sulfur deposited by the equation (A). The sulfur which is deposited during the leaching step in applicants' claims is stripped from the surfaces of the zinc concentrate during the grinding. Accordingly, the sulfur oxidation to create heat in Weir is irrelevant for applicants' claim 13.

Evans et al. USP 5,007,589 disclose that refractory type materials such as pyrite are milled to smaller particle sizes,

which is followed by leaching using an appropriate leach liquor, due to the fact that a portion of the metal, particularly, gold, which is physically encapsulated is released and made available for leaching (column 1, lines 29-38 of Evans et al.).

Evans et al. also teach that a simultaneous grinding and leaching is known, though it was stated that it has not been possible to economically treat certain materials (column 1, lines 42-52 of Evans et al.).

Evans et al. also describe a simultaneous milling and leaching accompanied with oxidation as described in column 2, lines 54-63; column 3, lines 46-52; and claim 10 of Evans et al.

The disclosures of Evans et al. as discussed above, are not accompanied with a deposit of the reaction product, which would be formed on the surface of the treated materials during leaching. The milling and grinding in Evans et al. are intended only to reveal the inner surfaces of the natural materials (ore or concentrate), but not to strip a reaction product which is unavoidably produced in a special leaching reaction.

In the presently claimed invention, during the direct leaching of zinc from the zinc concentrate, in the case using the

reaction shown in equation (A) above, elemental sulfur is formed, under a condition of not more than the melting point of sulfur (about 120°C), on the surface of the concentrate as a by-product with the progress of the leaching reaction. Such phenomena is not taught or suggested in Evans et al. Although Evans et al. teach that "milling releases iron and sulphur into solution" in column 2, lines 59-60, this means that the iron and sulfur dissolve into the leaching liquor (cyanide leaching liquor) by an oxidation treatment during the leaching and milling of the materials (gold containing sulfide ores), but does not mean the forming of a reaction product as solid state sulfur.

As disclosed above, Weir does not disclose conditions such that solid state elemental sulfur would be precipitated during a leaching, by controlling, for example, overoxidation under an oxidation pressure at a elevated temperature which is higher than the melting point of sulfur. In contrast thereto, applicants' claims 1 and 11 to 13 adopt conditions such that solid state elemental sulfur is precipitated on the surface of the zinc concentration during the leaching. This is a basic difference between applicants' claims 1 and 11 to 13 and Weir, and such

difference is not one which would be obvious from the disclosure of Evans et al., since Evans et al. do not mention the deposition of a reaction product of leaching.

Claims 4-6, 7-8, 9-10 and 19-20 were rejected over Evans et al. and Weir by referring to two additional references, namely Andre (USP 4,676,828) and Fugleberg et al. (USP 5,120,353). Such claims are dependent on the independent claims discussed above, all of which are respectfully submitted to be non-obvious from Evans et al. and Weir as discussed above. Thus, applicants respectfully submit that such dependent claims are not rendered obvious by the references for the same reasons as discussed hereinabove with respect to the independent claims.

It is therefore respectfully submitted that applicants' claimed invention is not rendered obvious over the references, either singly or combined in the manner relied upon in the Office Action in view of the distinctions discussed hereinabove. It is furthermore submitted that there are no teachings in the references to combine them in the manner relied upon in the Office Action.

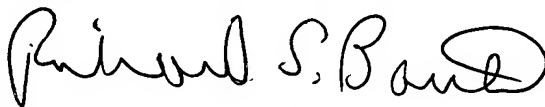
Reconsideration is requested. Allowance is solicited.

An INFORMATION DISCLOSURE STATEMENT is being filed
concomitantly herewith.

If the Examiner has any comments, questions, objections or
recommendations, the Examiner is invited to telephone the
undersigned at the telephone number given below for prompt
action.

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Respectfully submitted,



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Encs.: (1) PETITION FOR EXTENSION OF TIME
(2) REQUEST FOR FULLY INITIALED COPY OF FORM PTO/SB/08A
(3) INFORMATION DISCLOSURE STATEMENT